chip 31 and optical fiber 36 is effected by a ferrule support member 34, and is brought about as follows.

Chip carrier 30 has a conical surface 30b. Ferrule support member is provided with a ferrule receiving hole 34a and a tapered recess 35 at its opposed ends. Tapered recess 35 has a conical surface 35a having the shape of a circular cone into which conical surface 30b of chip carrier 30 fits. Ferrule 37 is received in ferule receiving hole 34a and includes a ferrule flange 37a which is soldered to ferrule support member 34. As stated in lines 18-20 of column 4, "The conical surface [35a] of the taper recess 35 of the ferrule support member 34 fits the conical surface [30b] of the carrier 30" and the two are soldered together. The soldering of ferrule 37 to ferrule support member 34 is then described in lines 28-35. The Fujihara et al. patent continues (column 4, lines 35-40):

> "The tapered optical fiber 36 is fixed beforehand to the ferrule 37 so that the PD chip 31 and the tapered optical fiber 36 are optically coupled at the maximum coupling efficiency when the ferrule 37 is thus attached in place to the ferrule support member 34 as shown in FIG. 2."

The second through fifth embodiments, as illustrated in FIGS. 5-7B, FIGS. 8 and 9, FIGS. 10 and 11, and FIGS. 12A-15, are similar to the first embodiments of FIGS. 2-4. It is noted that the third embodiment of FIGS. 8 and 9 shows a reversal of the interfacing cone surfaces of ferrule support member 57 and its taper surface which has the shape of a frustum of a circular cone. This third embodiment otherwise functions exactly as the first embodiment.

The present invention defines a completely different coupling concept. As stated in lines 13-26 on page 4,

> "... optic fiber 14 is inserted into entry portion or small terminus 32 of sleeve 22, core 16 is properly secured to connection point 12 in any manner necessary to minimize attenuation of optic signals, and the adhesive is cured. ... The resultant adhesive cures symmetrically in this position, due to the symmetrical shape of the sleeve interior wall and the multitude of equal segments 36a', 36a" and 36b', 36b" to eliminate undesired motion of the fiber from its preferred alignment position vis-a-vis connection point 12 or to provide a repeatable motion to achieve the optimum alignment position of the fiber with respect to the chip. The result is depicted in FIG. 3." (Emphasis applied)

This concept is succinctly claimed in independent claims 1 and 3: "an adhesive disposed within the cavity and symmetrically shaped thereby for precisely positioning and bonding the fiber to the chip." The Fujihara et al. patent does not disclose any use of an adhesive shaped by a symmetrical cavity, i.e., all of its conical members are solid, soldered-together members, and, therefore, is completely devoid of teaching the claimed concept.

Takahashi et al. discloses an optical fiber assembly comprising the following elements. A sheath 7 and optical fiber 8 are crimped in a metal pipe 9'. The optical fiber is inserted into a ferule 13 with the help of an indentation 18. A thermosetting epoxy 19 is placed within indentation 18 to bond the (crimped sheath 7 plus optical fiber 8 plus metal pipe 9') combination within the ferrule. The thermosetting epoxy performs no "precisely positioning and bonding the fiber to the chip" as claimed in independent claims 1 and 3.

Docket No. GCD 98-55-US

PATENT

In re Application of	)	
ARNOLD E. GOLDMAN, K. JUERGEN FLAMM,	)	
JOHN G. MARK & IKE SONG	)	
Serial No. 09/917,578	)	Art Unit 2873
Filed: 28 July 2001	)	
For: SLEEVE FOR PIG-TAILING OPTICAL FIBER	)	Examiner Omar Z. Hindi

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VERSION WITH MARKINGS TO SHOW CHANGES MADE - CLAIMS 1 - 3, 11 AND 17

(Per Response to Office Action dated 25 September 2002)

1. (Amended) A vehicle for enabling attachment of an optic fiber to a multi-integrated optic chip in optical communication therewith, and for maintaining alignm nt of the fiber at its end adjacent the chip, comprising:

a sleeve having a symmetrically-shaped cavity bounded by termini which respectively interface with the chip and the fiber; and

an adhesive disposed within the cavity and symmetrically shaped thereby for precisely positioning and bonding the fiber to the chip.

2. (Twice Amended) A vehicle for enabling attachment of an optic fiber to a multi-integrated optic chip in optical communication therewith, and for maintaining alignment of the fiber at its end adjacent the chip, comprising:

a sleeve which has a symmetrically-shaped cavity bounded by termini that respectively interface with the chip and the fiber, and in which

said cavity has an axis and is internally bounded by a wall which is substantially centered on the axis and which extends from said chip-interfacing terminus to said fiber-interfacing terminus,

said termini are centered on the axis, and

a line, lying within any plane intersecting the axis at right angles thereto and terminating in said cavity wall, is bisected into two equal segments; and

an adhesive disposed within the cavity and symmetrically shaped thereby for precisely positioning and bonding the fiber to the chip.

3. (Twice Amended) A vehicle for enabling attachment of an optic fiber to a multi-integrated optic chip in optical communication therewith, and for maintaining alignment of the fiber at its end adjacent the chip, comprising:

a sleeve which has a symmetrically-shaped cavity bounded by termini that respectively interface with the chip and the fiber, and which is configured to fit onto the chip and is disposed to accept the fiber; and

an adhesive disposed within the cavity and symmetrically shaped thereby for precisely positioning and bonding the fiber to the chip.

4. A vehicle according to claim 3 wherein:

said cavity has an axis and is internally bounded by a wall which is substantially centered on the axis and which extends from said chip-fitting terminus to said fiber-accepting terminus;

said termini are centered on the axis; and

a line lying within any plane intersecting the axis at right angles thereto and terminating in said cavity wall is bisected into two equal segments.

5. A vehicle according to claim 4 wherein said cavity wall slopes from said chip-fitting terminus to said fiber-accepting terminus.

6. A vehicle according to claim 4 in which said sleeve so controls said adhesive as to provide and preserve a symmetrical bonding of the fiber with respect to the chip over gravitational and wicking effects.

7. A vehicle according to claim 6 in which said cavity wall is shaped as a truncated right circular cone.

8. A vehicle according to claim 6 in which said cavity wall is shaped as a truncated pyramid.

9. A vehicle according to claim 4 in which said sleeve is temporarily attached to said adhesive and the chip.

10. A vehicle according to claim 4 in which said sleeve is permanently attached to said adhesive and the chip.

11. (Amended) A method for attaching an optic fiber to an optic chip and for maintaining alignment of the fiber at its end adjacent the chip, comprising the steps of:

positioning a sleeve having a symmetrically shaped cavity on the chip;

placing an adhesive into the sleeve cavity for being symmetrically shaped thereby;

inserting the fiber into the cavity;

securing the fiber to the chip; and

curing the adhesive whereby the adhesive, as symmetrically shaped by the cavity, precisely positions the fiber to the chip.

12. A method according to claim 11 further comprising the step of aligning the fiber within the cavity and positioning the fiber end adjacent the chip.

13. A method according to claim 11 further comprising the step of removing the sleeve from the chip after the adhesive has cured.

14. A method according to claim 11 further comprising the step of leaving the sleeve securely on the chip after the adhesive has cured.

15. A method according to claim 11 further comprising the step of providing the sleeve cavity with a truncated pyramid configuration.

16. A method according to claim 11 further comprising the step of providing the sleeve cavity with a truncated right circular cone configuration.

17. (Amended) A method for attaching an optic fiber to an optic chip and for maintaining alignment of the fiber at its end adjacent the chip, comprising the steps of:

utilizing a sleeve having a symmetrically shaped cavity;

placing an adhesive into the sleeve cavity for being symmetrically shaped thereby;

positioning the sleeve onto the chip;

inserting the fiber into the cavity;

aligning the fiber within the cavity and positioning the fiber end adjacent the chip;

securing the fiber to the chip; and

curing the adhesive whereby the adhesive, as symmetrically shaped by the cavity, precisely positions the fiber to the chip.

18. A method according to claim 17 further comprising the step of removing the sleeve from the chip after the adhesive has cured.

19. A method according to claim 17 further comprising the step of leaving the sleeve securely on the chip after the adhesive has cured.

20. A method according to claim 17 further comprising the step of providing the sleeve cavity with a truncated pyramid configuration.

21. A method according to claim 17 further comprising the step of providing the sleeve cavity with a truncated right circular cone configuration.

B1

Sub C1

1. A vehicle for enabling attachment of an optic fiber to a multi-integrated optic chip in optical communication therewith, and for maintaining alignment of the fiber at its end adjacent the chip, comprising:

a sleeve having a symmetrically-shaped cavity bounded by termini which respectively interface with the chip and the fiber; and

an adhesive disposed within the cavity and symmetrically shaped thereby for precisely positioning and bonding the fiber to the chip.

2. A vehicle for enabling attachment of an optic fiber to a multi-integrated optic chip in optical communication therewith, and for maintaining alignment of the fiber at its end adjacent the chip, comprising:

a sleeve which has a symmetrically-shaped cavity bounded by termini that respectively interface with the chip and the fiber, and in which

said cavity has an axis and is internally bounded by a wall which is substantially centered on the axis and which extends from said chip-interfacing terminus to said fiber-interfacing terminus,

said termini are centered on the axis, and

a line, lying within any plane intersecting the axis at right angles thereto and terminating in said cavity wall, is bisected into two equal segments; and

an adhesive disposed within the cavity and symmetrically shaped thereby for precisely positioning and bonding the fiber to the chip.

C1
B1 Cont'd

3. A vehicle for enabling attachment of an optic fiber to a multi-integrated optic chip in optical communication therewith, and for maintaining alignment of the fiber at its end adjacent the chip, comprising:

a sleeve which has a symmetrically-shaped cavity bounded by termini that respectively interface with the chip and the fiber, and which is configured to fit onto the chip and is disposed to accept the fiber; and

an adhesive disposed within the cavity and symmetrically shaped thereby for precisely positioning and bonding the fiber to the chip.

4. A vehicle according to claim 3 wherein:

said cavity has an axis and is internally bounded by a wall which is substantially centered on the axis and which extends from said chip-fitting terminus to said fiber-accepting terminus;

said termini are centered on the axis; and

a line lying within any plane intersecting the axis at right angles thereto and terminating in said cavity wall is bisected into two equal segments.

5. A vehicle according to claim 4 wherein said cavity wall slopes from said chip-fitting terminus to said fiber-accepting terminus.

6. A vehicle according to claim 4 in which said sleeve so controls said adhesive as to provide and preserve a symmetrical bonding of the fiber with respect to the chip over gravitational and wicking effects.

7. A vehicle according to claim 6 in which said cavity wall is shaped as a truncated right circular cone.

B1 Cont'd C1

8. A vehicle according to claim 6 in which said cavity wall is shaped as a truncated pyramid.

9. A vehicle according to claim 4 in which said sleeve is temporarily attached to said adhesive and the chip.

10. A vehicle according to claim 4 in which said sleeve is permanently attached to said adhesive and the chip.

11. A method for attaching an optic fiber to an optic chip and for maintaining alignment of the fiber at its end adjacent the chip, comprising the steps of:

positioning a sleeve having a symmetrically shaped cavity on the chip;

placing an adhesive into the sleeve cavity for being symmetrically shaped thereby;

inserting the fiber into the cavity;

securing the fiber to the chip; and

curing the adhesive whereby the adhesive, as symmetrically shaped by the cavity, precisely positions the fiber to the chip.

12. A method according to claim 11 further comprising the step of aligning the fiber within the cavity and positioning the fiber end adjacent the chip.

13. A method according to claim 11 further comprising the step of removing the sleeve from the chip after the adhesive has cured.

B1 Cont'd C1

14. A method according to claim 11 further comprising the step of leaving the sleeve securely on the chip after the adhesive has cured.

15. A method according to claim 11 further comprising the step of providing the sleeve cavity with a truncated pyramid configuration.

16. A method according to claim 11 further comprising the step of providing the sleeve cavity with a truncated right circular cone configuration.

17. A method for attaching an optic fiber to an optic chip and for maintaining alignment of the fiber at its end adjacent the chip, comprising the steps of:

utilizing a sleeve having a symmetrically shaped cavity;

placing an adhesive into the sleeve cavity for being symmetrically shaped thereby;

positioning the sleeve onto the chip;

inserting the fiber into the cavity;

aligning the fiber within the cavity and positioning the fiber end adjacent the chip;

securing the fiber to the chip; and

curing the adhesive whereby the adhesive, as symmetrically shaped by the cavity, precisely positions the fiber to the chip.

18. A method according to claim 17 further comprising the step of removing the sleeve from the chip after the adhesive has cured.

B1 Cl.

B1 End

19. A method according to claim 17 further comprising the step of leaving the sleeve securely on the chip after the adhesive has cured.

20. A method according to claim 17 further comprising the step of providing the sleeve cavity with a truncated pyramid configuration.

21. A method according to claim 17 further comprising the step of providing the sleeve cavity with a truncated right circular cone configuration.